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Designing a New Utility Business Model?
Better Understand the Traditional One First

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ABSTRACT

There appears to be a consensus among energy efficiency advocates that traditional utility regulation rewards sales growth and penalizes efficiency. Economic history, however, appears to tell a more-nuanced story. While we cannot isolate the impacts of energy efficiency per se, we can see that gas utilities stocks have outperformed their electric utility counterparts over the long haul, despite selling less product today than they did forty years ago. (Moody's, 2000)

Stock prices are influenced in part by changing expectations about the economic value-added created (or destroyed) when utilities build assets. This metric is influenced not only by internal factors, but also by macroeconomic cycles. Historically, periods in which utility asset expansion adds value precede periods in which it diminishes value. The ratemaking model stays the same but the inputs to it change, and as a result the incentives that model creates for utilities change substantially. Focusing on the incentives that the traditional ratemaking model provided in the recent past tells us little about the incentives those same mechanics will likely provide over the next several decades.

The purposes of this paper are: (1) to describe the existing utility business model at its most fundamental level; (2) to show that this simplified expression can successfully explain past utility financial performance and behavior; and (3) to draw inferences from the model about how current and potential future market conditions are likely to impact utilities' performance and behavior going forward.

Introduction

There is near universal agreement among energy efficiency and renewable energy advocates that the existing structure of utility regulation, the system that defines the utility business model, creates disincentives for investor-owned utilities to promote energy efficiency and customer-owned distributed generation, such as solar photovoltaic (PV) systems (SEIA 2014). When energy resources are realized on the customer-side of the meter, not only do utility sales decline, but over the long run they also deprive utilities of opportunities to grow their profits because increased use of non-utility resources by customers reduces future utility demand and diminishes the utilities' need to add supply-side assets. Because past utility growth and profit strategies have often been based on adding supply assets, there is a concern that reducing the need for adding these assets will endanger the financial viability of utilities under their current business model.

With this issue looming large, there is widespread support for a new utility business model, one that aligns utilities' financial interests in such a way that they can promote increased use of more socially desirable energy resources (Weedall 2013). Looking for a better utility business model is undoubtedly a worthy activity, and such efforts should proceed. But we should enter that discussion with full knowledge of the incentives and disincentives associated with the

traditional model. There is more to these incentives and disincentives than meets the eye, and they are not static, but rather change over time. It is a fact that increasing penetration of customer-owned resources and increase use of energy efficiency measures will limit the ability of utilities to make profitable investments in supply-side assets (LaMonica 2013). The assumption that this will necessarily be financially harmful to utility investors requires further exploration.

When analyzing incentives and disincentives for utilities to expand we must use the proper metric. If we are interested in measuring shareholder value, neither the aggregate profit level nor the rate of return is the variable of interest. The finance literature is unequivocal in that the objective of management should be to maximize shareholder value, which is not fully represented by profit or corporate rate of return, but is better represented by stock prices, which reflect future expectations about risk-adjusted cash flows (Damodaran 2012). That is to say we do not find the ultimate information about investor value on a firm's financial statements; we find it in the financial markets. And under certain circumstances, conditions that have held for long periods in the utility industry in the past, taking actions that increase profits, specifically investing in new facilities, have caused utility investor value to decline. That is, while investing in new plants increased profits, it also led to loss of investor value—substantial loss, for that matter.

Rate of Return, Cost of Capital, And Investor Value

Several decades ago utility executives en masse issued statements that they were going to avoid large-scale plant investment whenever possible, even if load continued to grow. Their statements were grounded in the financial concepts we discuss here. At that time the Congressional Budget Office feared that the disincentive for utilities to make plant investment could lead to a more-expensive power supply.

> The nation's electricity supply could become less cost-effective if regulatory incentives continue to bias utilities away from capital investments (CBO 1986).

What model were utilities operating under that created a disincentive, not an incentive, to invest in plants? The same one in place today.

The key to creating value for investors is not whether utilities can earn positive returns on plant investment, but rather whether those returns exceed the cost of obtaining the funds to make the investment. When a project can offer a return that lies above the cost of capital, plowing money into such projects creates value for investors. Conversely, even though any positive return on a plant would make for a profitable investment from an accounting perspective, if the rate of return lies below the cost of obtaining the funds for that investment, every dollar invested diminishes rather than creates investor value. This is a basic tenet of corporate finance:

> The bigger the positive spread between a company's return [r] and the cost of capital [k], the more it will gain in relative market value from growth. When returns fall below the cost of capital, higher growth leads to lower valuations (Koller et al. 2010).

The profit-maximization strategy calls for investing in a plant whenever r is positive, but the correct metric for evaluating this decision is optimizing shareholder value, not profit. To find the

threshold return that must be met to create value we need to compare r to the cost of raising the funds to make that investment, which is the cost of capital k. In other words, the condition necessary to create investor value by building a power plant is that r must be greater than k. That is a much more difficult condition to meet than simply making a profit on the investment, and utilities have not always been able to meet that critical threshold. When they have not, the investment utilities made destroyed billions of dollars of investor value, even though utility profits increased substantially as a result of that plant expansion.

This discussion leads to the following correction to the investment incentive proposition espoused by many:

INCORRECT | $r > 0$ | utilities have an incentive to expand

CORRECT | $r > k$ | utilities have an incentive to expand
| $r = k$ | utilities are indifferent as to whether they expand
| $r < k$ | utilities have a disincentive to expand

Capital, like any other input to a production process, is not free. This should have intuitive appeal. Does it seem likely that utilities would rush to expand their facilities if regulators allow them to earn, for example, a 2 percent return on such investment? Clearly there is some minimum acceptable level of return. The cost of capital, by definition, is that minimum return hurdle (Phillips 1988).

This corrected incentive structure should give some readers pause. Many, if not most, regulators say that they set utility rates of return equal to the cost of capital. If that condition held, utility management focused on creating value should not care whether it ever makes any plant investment. Just as buying apples for 50 cents and selling them for 50 cents creates no value for the grocery store owner, raising capital at a cost of 10 percent to invest in assets that earn 10 percent is similarly a financial wash—no matter how large the investment, it creates no investor value.

The utility regulation literature makes it clear that if r equals k on a consistent basis, the utility would be stuck on a metaphorical value-creation treadmill. Running faster (investing more in plants) gets the utility nowhere in terms of creating investor value. A utility operating under this condition would be equally valuable to investors whether it continued to operate or ceased operations and sold off its assets (Train 1991). Under such circumstances, value-oriented utility managers would not be troubled by loss of investment opportunities to competitors, such as distributed generators, because while those lost opportunities would deprive the utility of the ability to increase accounting asset values and profits, they would have no effect on its stock price. The fact that in long periods of time utility managers have wanted to make plant investment while in other long periods they have wanted to avoid that investment suggests that, as a rule, r generally does not equal k for regulated utilities (Myers and Borucki 1994; Kahn 1988; Kihm 2011).

Empirical Evidence from the Utility Industry

With the proper corporate finance framework established, let's next explore an extremely interesting, but financially painful, time in the history of utility regulation. From 1965 to 1980, the cost of capital increased for all firms. Figure 1 shows utility bond yields increasing noticeably over this period.
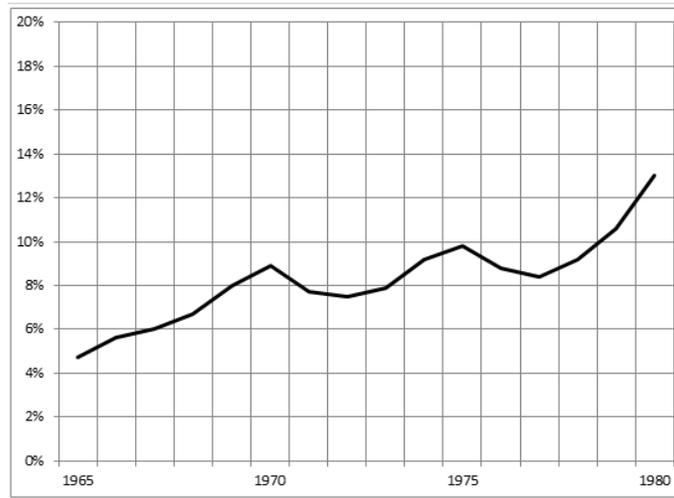
Figure 1. Utility Bond Yields (1965-1980). Source: *Moody's Public Utility Manual*.

We see that in 1965 utilities could borrow funds at a cost of less than 5 percent per year. By 1980, that cost had more than doubled to 13 percent. But the cost of debt is not the ultimate variable of interest here. Stock prices depend on returns on equity and costs of equity. Even though we know the cost of equity exists, we can never observe it directly. As an opportunity cost, it represents a foregone return, the one investors could have earned if they had invested in other similar-risk firms instead of in the utility. Since equity is more risky than debt, and since the cost of capital increases with risk, the cost of equity must lie above the cost of debt. A reasonable rule of thumb espoused by stock analysts is that the cost of equity for a utility is about 3 to 4 percentage points above the cost of corporate bonds (Childs, 1993; Damodaran 2012). We will assume for purposes of this exposition that that the cost of equity is 3 percentage points above the cost of utility debt. See Figure 2.
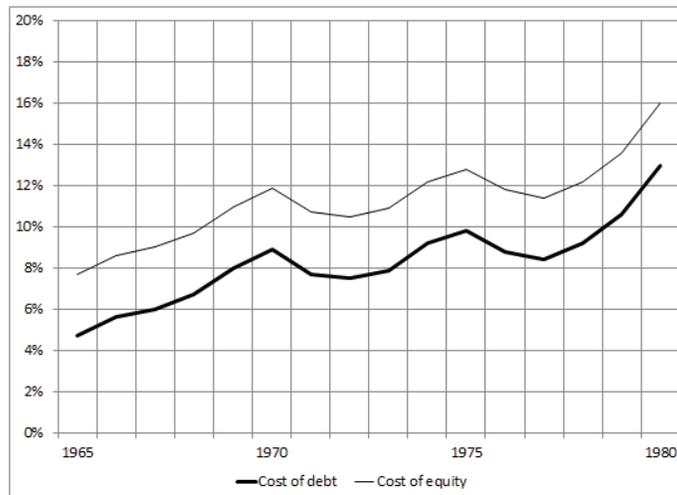

Figure 2. Utility Bond Yields and Estimated Cost of Equity for Moody's Electric Utility Stock Index (1965-1980). Source: *Moody's Public Utility Manual*.

Whether utility plant investment made over this period would increase investor value depended on investor expectations as to whether the traditional regulatory model would allow utilities to earn equity returns in excess of the cost of equity. An important reference point is the returns on equity that utilities, in our case electric utilities, were actually earning at the time. We see those returns added to the image in Figure 3.

This painted a bleak picture for utility investors. However, it is important to take a closer look at other factors that impacted the true cause and effect. It was not that all regulators refused to increase authorized returns on equity in times of increasing costs of capital, for many actually did increase them. Nevertheless, the increased returns often lagged increases in the cost of capital and it became increasingly difficult for utilities to actually earn those authorized returns. Increasing inflation rates (see Figure 4) coupled with increasing interest rates presented the utilities with a particularly difficult environment.
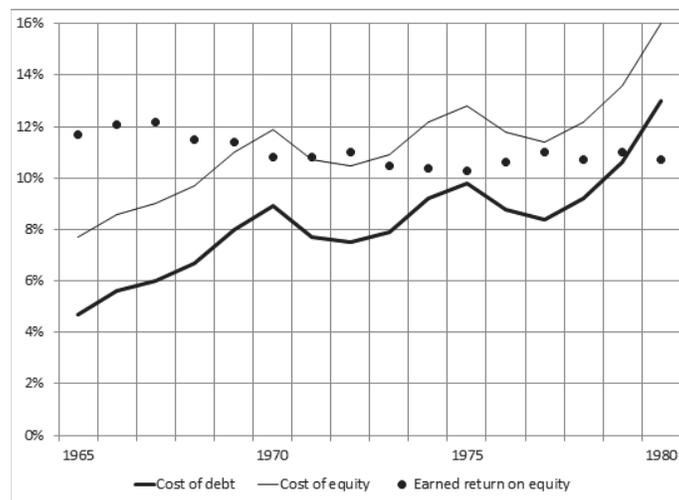

Figure 3. Utility Bond Yields, Estimated Cost of Equity (1965-1980) and Earned Returns on Equity for Moody's Electric Utility Stock Index. Source: *Moody's Public Utility Manual*.

The rapid year-to-year increase in the cost of providing service weighed heavily on the utilities. Even though many regulators were increasing authorized returns on equity over this period, their adjustments often failed to keep pace with the rapid increase in the cost of capital. Even if they did set a return that at least matched the cost of equity, once the regulators set utility rates those prices remained largely static until the next rate case. Rising interest rates and inflation rates pushed costs above those used to set rates, making it almost impossible for utilities to earn their authorized returns. Referring back to Figure 3 we see that by 1980 not only were utilities failing to earn the cost of equity, at that point they were actually earning less than it cost them to raise debt.
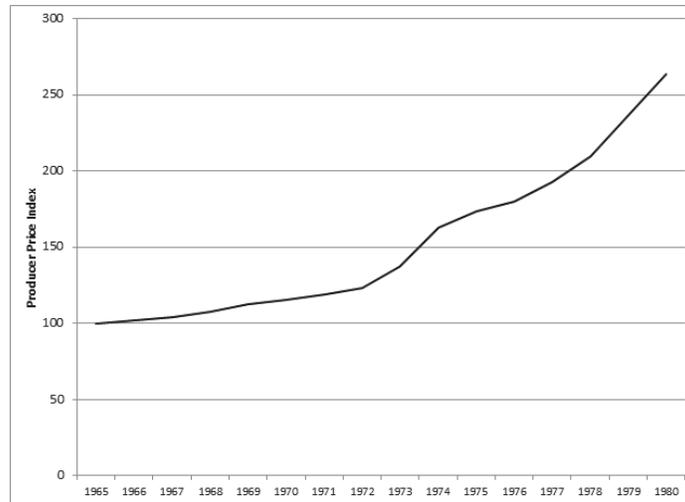
Figure 4. Producer Price Index (1965 = 100). Source: Bureau of Labor Statistics.

So did utilities expand during this period? Unfortunately for their investors, the answer is yes. Figure 5 provides the final piece of the perfect storm that led to massive value destruction for utilities, which we will document in a moment. In 1965, when electric utilities earned returns on equity that exceeded the cost of equity by +4.0 percentage points, the industry spent less than $2 billion on new plant construction. By 1980, when the spread between the earned return and the cost of equity had declined to -5.3 percentage points, the industry was spending about $9 billion on new plant, much of it nuclear generation capacity.

So how did all of this affect utility *profitability* (not investor value)? Even though the earned rates of return on equity generally did not increase over the period in question, electric utility earnings per share grew by 51 percent. The only way a largely stable rate of return on equity can produce earnings per share growth is if the underlying accounting book value per share grew over time. (Book value is the accounting convention that includes the equity portion of plant investment, as well as any retained earnings.) It did, as we see in Figure 6. From an *accounting perspective*, this plant investment was making utilities more valuable.
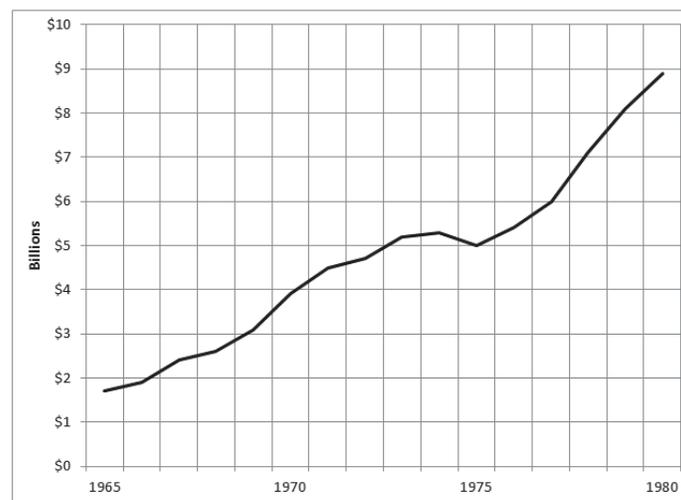

Figure 5. Annual electric utility construction expenditures (1965-1980). Source: *Moody's Public Utility Manual*.

All of the things that many think would be viewed as positive developments for utilities—growth in book value, earnings and dividends—were manifest over the 1965-1980 period. To put this in the commonly used construct all this plant investment substantially increased utility profits. If profit-maximization was the goal, this was a period of great utility success.
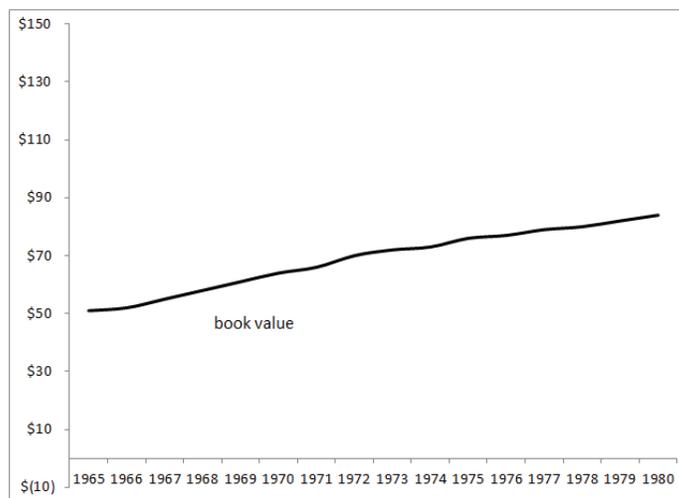

Figure 6. Moody's Electric Utility Index book value per share (1965-1980). Source: *Moody's Public Utility Manual*.

But if finance theory is correct, since the industry was making this capital investment while earning returns below the cost of equity, we should find that utility expansion of this scale took a huge toll on investor value. We do. Figure 7 shows that electric utility stocks lost about half of their value over this period. Some might suggest that the significant loss of market value was due to disallowances of plant investment. That argument fails to recognize that total disallowances of utility plant investment during this construction boom ultimately amounted to only 7 percent of total investment, not enough to explain a 50 percent loss in market value. (Lyon, 2005)
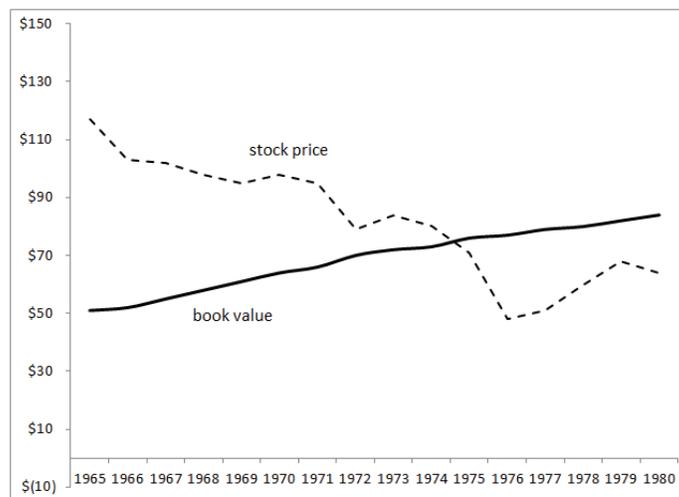

Figure 7. Moody's Electric Utility Index book value per share and stock price per share (1965-1980). Source: Moody's Public Utility Manual.

Furthermore, gas utilities, which faced no major plant disallowances, saw their stocks decline by 22 percent over this period, suggesting that the regulatory model in general was failing to protect investor value over this period. (Moody's, 2000) In contrast, the overall stock market, as represented by the S&P 500, increased by 50 percent over this period.

Electric utility stocks sold at over twice book value in 1965, which was a reasonable valuation given the degree to which utility returns exceeded the cost of capital. By the late 1970s and early 1980s they were trading at about 80 percent of book, which again was rational given the reversal of the important relationship between the company's earned return (*r*) and its cost of capital (*k*). This historical analysis therefore verifies that the essence of the financial value creation model is on track.

Note, however, that while deteriorating macroeconomic conditions could pose such problems in the future, that is not the key point we are making. The important takeaway is that anything that can close the gap between the earned return and the cost of capital affects the incentive for utilities to expand. If the gap disappears, so does the incentive. If the gap goes negative, expansion destroys utility investor value. If that outcome is likely then utilities should welcome actions that allow them to avoid future plant investment. All of these incentives and disincentives can occur and have occurred under the traditional utility business model. Structural shifts have occurred throughout the course of history, and future states of the world are highly uncertain. Today utilities generally earn returns in excess of the cost of capital. We know that because they trade at a noticeable premium to book value.

> *If the return on equity [r] exceeds the cost of equity [k], the price will exceed the book value of equity; if the return on equity is lower than the cost of equity, the price will be lower than the book value of equity* (Damodaran 2012).

The point, though, is not whether investors today expect returns to exceed the cost of capital, but rather whether we can count on that continuing in the long-run future. Investors in 1965 who were willing to pay more than twice book value for utilities assets had likely been lulled into a sense of complacency due to the supportive regulatory environment they had found themselves in since World War II. While it was difficult to see it coming, at that point gentle tail winds were about to turn into hurricane-force head winds which turned utility plant investment from a value-creating to a value-destroying activity. The question to all of us then is: what does the financial weather forecast look like for utilities as we peer into the future? That is what will determine whether utilities truly have an incentive to invest in their systems.

Implications for the Utility Industry in the Near Future

The finance theory presented here is not new nor is it unique to the utility industry. While utility finances can get a great deal more complicated than the stripped-down version outlined here, the simple core of principles of finance remain. Any entity that wishes to increase investor value must pay less for its investment capital than it earns when it puts that capital to work. Faced with this immutable reality and the vagaries of electricity markets, what does this mean for the future of the utility business and its business model?

To this point, this discussion has been mainly retrospective and deterministic. In discussing future investment decisions, risk and uncertainty play a critical role. In addition to the riskier nature of equity investment relative to debt as mentioned above, the issue of risk is already inherent in this discussion: The riskier an investment is, the higher the rate of return that

it must offer to attract capital without causing a loss in investor value (Morin 2006). Note that firms can and do issue stock when expected returns lie below the cost of capital, but they do so at the expense of their existing investors who see the stock price decline, which is precisely what happened for utilities in the 1965-1980 period.

> *When expected earnings [r] are less than investors' requirements [k] and a sale of stock occurs, new shareholders can expect to gain their return requirement at the expense of the old shareholders* (Morin, 2006).

In this context, the cost of capital that utilities face, k, is a critical component in the decision of whether or not to build new generating assets, or any assets for that matter. If potential investors see the utility business as inherently more risky than other investments, they will demand a higher minimum rate of return, a higher k. This increases the threshold that utilities' return on investment must reach for a project to be financially sound.

Generally speaking, anything that makes the return on generation projects more risky, the higher the rate of return on those projects must be to justify them. In one of the injustices of utility financing, investors get to price their uncertainties into the cost of capital, k, in advance. Utilities, on the other hand, with retail prices subject to PUC decisions, do not get the same privilege with respect to r.

To see why this creates a problem for utilities, imagine the following simplified situation: A utility is considering building a power plant with prices regulated by a PUC that quickly and accurately adjusts electricity rates in reaction to changes in the utilities' costs. Imagine that the utility is considering building a new power plant but also faces some uncertain future that could impact its profitability, such as a carbon tax. If a carbon tax is implemented, the PUC will act swiftly to ensure that it is fully passed on to the utility's customers. This way the utility knows that it will be held harmless if the tax is enacted, and if r is currently 9%, the PUC will maintain r at 9% whether or not the tax is implemented.

Imagine further that equity investors had previously had a k of 8%, so that before the carbon tax became a possibility, the new plant would have been a financially sound investment (i.e., 9% > 8%). Now that the carbon tax is a possibility, however, investors may become more wary of the profitability of the new plant. They may doubt that the PUC will act swiftly to adjust utility rates; they may believe that the proposed carbon tax is just the beginning of a new era of regulation and that the PUC may not be able to fully pass on the costs associated with a new suite of regulations. Whatever the rationale, investors perceive increased risk and increase their k to 10%, for example, and the plant is no longer financially viable and does not get built. (Assume the utility then purchases power from a neighboring utility or independent power producers.)

If the carbon tax does not get enacted, or if it does and the PUC would have moved as swiftly and completely as it promised, then, ex-post, the plant would have been a value-creating use of investor funds. But because the possibility of the carbon tax increased the ex-ante risk associated with the project, it did not get built, and investors missed out on the opportunity. In practice, of course, PUC's don't necessarily move instantly to exactly adjust prices to maintain a given r. Utilities must therefore make a build vs. power purchase decision based on their expected rate of return, $E(r)$. The basic rule needs to be modified to reflect this uncertainty: If the utility believes that its returns on a project will exceed the known costs of capital, i.e. if $E(r) > k$, then a project is financially sound, ex-ante.

Returning to the carbon tax example above, imagine now that the carbon tax is a certainty fully expected by both the utility and equity investors. Imagine further that both the utility and investors believe that the PUC will act to raise electricity rates once the carbon tax is enacted, but that there will be a delay between the enactment of the tax and when the PUC raises rates. This belief reduces the risk somewhat, and k increases from 8% to 9%. However, if uncertainty about the speed and completeness of the PUC's actions lowers the expected return, $E(r)$, at all, the plant again fails the build/no-build test and the utility does not make the investment.

In the scenarios above, the introduction of uncertainty and risk turned a financially sound project into an unsound one at the time that the build/no-build decision had to be made. Generally speaking, anything that raises the perceived risk of investing in plant construction or that increases the uncertainty of utility returns will raise k or lower $E(r)$, or both, reducing, or perhaps even eliminating, the incentive to build new generating plants. Looking forward, there are several such factors that serve to make building new generating assets less financially attractive. The same financial construct applies to transmission and distribution assets, although the risks associated with those assets differ from those associated with generation assets, which is the asset type we focus on here.

Greenhouse gas regulation. Though seemingly less likely now than it was a few years ago, the potential for direct regulation of emissions of carbon and other greenhouse gases introduces a number of risks to electricity generating projects. The Environmental Protection Agency is in the process of writing and enacting regulations pursuant to the Clean Air Act. These amendments would regulate the emission of carbon from new and existing power plants. These regulations may reduce electricity demand, raise generating costs, and necessitate capital investments that otherwise would not occur. Any of these impacts could raise k and lower $E(r)$, reducing the incentive to build new power plants.

Rising interest rates. In the aftermath of the financial crisis of 2008 and the recession that followed, interest rates remain at historically low levels. These low rates have resulted in very low capital costs for utilities, a situation which is unlikely to persist indefinitely. The U.S. Energy Information Administration projects noticeable increases in yields on Treasury bonds and corporate bonds over the remainder of the decade (EIA 2014). As interest rates start to rise, the cost of capital will rise with it, making new generating assets more expensive to finance. To the extent that investors recognize that interest rates are likely to rise in the future, capital costs may already be reflecting this expectation, though the effect may become much more pronounced once rates start to increase. The key question is whether utilities can earn returns in excess of the cost of capital in an era in which the cost of capital is rising. This is by no means a sure thing, as history reveals.

Inflationary pressures. One of the policy responses to the financial crises and recession was a rapid expansion of the money supply. Under normal economic conditions, such an expansion would normally result in inflation. In the current slack economy, inflationary fears have gone largely unrealized. However, as the economy continues to expand, the monetary expansion may begin to exhibit its side effects in the form of higher inflation. As in the past, PUC's and other regulators may not respond to inflation by rising electricity rates quickly enough, and may be unwilling or unable to raise them in concordance with rapidly rising inflation.

Falling electricity demand. The annual growth rate of electricity consumption has fallen significantly over the past 50 years, from near 10-12% per year in the 1950s to below 2% since the mid 2000s. If the trend continues, either due to continued economic uncertainty, structural shifts in the economy, increased use of distributed generation, or the prevalence of successful energy efficiency programs, weak electricity demand could reduce the expected return on power plant investments, and reduce the need and incentives for new generating assets.[1]

Fuel price volatility. There are many economic, political, and environmental factors that can influence the supply and demand of fuel, causing volatility in prices. In some states, regulators have limited the extent to which these costs can be passed along to customers, lowering E(r) for utilities.

Sunk or stranded costs. Decision makers in the utility industry cannot act with perfect foresight. The perceived risk to revenues caused by mandatory Demand Side Management (DSM) and energy efficiency programs also play a role in determining E(r). In addition, there is a risk that investments in programs that reduce the demand for new generation could result in stranded costs from recent investment in new generation, or even from not so recent investments given the long depreciation schedules attached to capital investments.

Competition from new products or markets. The growing market penetration of DSM and Distributed Energy Resources (DER) can lead to decreased revenues which, coupled with long depreciation lives for power plant investments, can hinder a utility's ability to recover costs through ratemaking. There is an added risk as the burden of these costs are passed along to consumers, that consumers will adopt alternative products or participate in new markets to supply energy demand, perhaps by installing solar PV-gas turbine hybrid systems that allow them to disconnect from the grid (Graffy-Kihm 2014). Such "disruptive forces" are not yet readily available or widely affordable, and the timeline for the availability of these products and markets can be hard to predict. However, forward-thinking utility decision makers are likely aware of this risk, and it may be factored in to expected rate of return (Kind 2013).

Conclusions

Redesigning utility business models cannot be done in a vacuum, one that considers only energy efficiency or renewable energy issues. A macro perspective based on corporate finance principles provides the proper view regarding utility incentives and disincentives. A good business model will be founded on providing incentives for utilities to increase shareholder value. The factors we just discussed demonstrate the degree of uncertainty that can influence the outcomes of utility executives' decisions. Utility rates of return are not guaranteed, especially over the long-term. Furthermore, there is no guarantee that utilities will be able to recover the costs of new plant investments over the next 30 years, let alone earn returns on those costs. The industry is aware of these potential threats to their retail business (Kind 2013).

As industry searches for new ways to increase or at least maintain investor value and other stakeholders look for new business models that reward investments in energy efficiency and clean energy production, it is important to keep the impact of uncertainty on E(r) in mind.

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[1] Note that since revenue decoupling tends to push E(r) to the authorized r, and not to k, decoupling does nothing to address incentives or disincentives created when authorized r differs from k.

We have demonstrated the existing business model is based on relatively simple financial principles that are likely to continue to apply whether the market grows or shrinks, and regardless of the types of investments being made. The point not to be missed is that this value-creation construct is the one the financial markets will apply even under new utility business models.

As we seek a framework for a new utility business model, it is critical that we measure success in terms of optimizing shareholder value, rather than simply maximizing profits, and that we recognize that shareholder value is not tied uni-directionally to supply asset investment. Just as past investments in supply assets helped destroy shareholder value under the current business model, so too can reducing investments enhance shareholder value, under the right circumstances. Furthermore, we need to broaden our paradigm of what influences decision-makers' ability to meet this condition to account for uncertain future states of the world.

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(END OF APPENDIX A)